## X-ray Structure Determination

A PRACTICAL GUIDE

George H. Stout
Department of Chemistry
University of Washington

Lyle H. Jensen

Department of Biological Structure
University of Washington

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**EXHIBIT A** 

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In Memoriam
A. L. PATTERSON

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Symmetry Operations and Space Groups

Fraction

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Table 3.2 Space	Table 3.2 Space Groups in Standard Orientations	Orientations•					
System	Point groups			Space	Space groups	- 1	
Triclinic		P1					
	2	72	23	ឧ			
Monocitaic	7. 2/m	Pm P2/m	Pe P21fm	Ω <u>π</u> Ω7/ <u>π</u>	13 15 15 15 15 15 15 15 15 15 15 15 15 15		P2.10
	122	277	P222,	P2,2,2	P2,2,2,	ì	C2221
		722	111	12,2,2,			
	2.5	Pmm2	Pmc2,	Pech	Pma2	_	Pca2,
		Proof.	Pba2	Pred2,	Pron2	_	Cmmo
٠		Cec2	Amm2	Abma	Ama2	•	4602
Orthorhombic		Foltz	Imm2	Iba2	Ima2		
	E	Power	Pran	Рсст	Pban	-	Pmma
		Pmma	Peca	Póam	Peen	134	фсы
		Prome	Pbcn	Poca	Printa	•	Этст
		Commun	Cccm	Contrad	Ccea	_	mmm.
		(munu)	.Ibam	Ibea	Imma		
	4	P4	P4,	P41	.P4,	_	2
	М	P4	Z.				
	4/m	Pajm	P41/m	P4/n	P41/11	_	!4/m
Tetragonal	422	P422	P42,2	P4,22	P4,2,2	_	P4,22
	!	P4,22	P4,2,2	1422	14,22		
	4mm	P4mm	P46m	P4zem	P42m	•	PAcc
		P4.mc	P4,5c	I4mm	I4cm		J4,™d

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Tetragonal	•	,	•	į	į		ļ			
Human   Pajimen   Pajime		42m	P42m P462	7. 27. 27. 27. 27. 27.	P421m [4m2	P421c 14c2	P4m2 142m	<b>P</b> 4c2		
1	Totractor	4/mmm	P4/mmm	P4/mcc	P4/nbm	P4/mo	P4/mbm	P4/mirc	1/16	§3.4
13   P.3	· HEROSETAT		P4firmm	P4/nco	P41/mmc	P4x/mcm	P4z/mbc	P42/mm		<b>!</b> ]
3         P3         P3, P3         P3,			14.famd	I talman I4, lacd	r 4a/runc	r41(acm	rtmmt.	s4 mcm	0 <u>.</u>	
3         P3         R3           3.2         P312         P321         P3,12         P3,12         P3,12         P3,21           3m         R32         P31m         P31m         P3c1         R3m         R3c           5m         P6         P6,         P6,         P6,         P6,         P6,           6         P6         P6,         P6,         P6,         P6,         P6,			£.	P3,	P3,	£3			1,6	_
32         P312         P321         P312         P321         P312         P321         P312         P321         P	ч <b>.</b> '	m	K	R3					25	
3m         R32         P31m         P3ci         P3ci         R3c         R3c           5m         P6         P6,         P6,         P6,         P6,         P6,         P6,           6         P6,         P6,         P6,         P6,         P6,         P6,         P6,         P6,           6         P6,	Trigonal/ Rhombohedral,	32	P312	P32i	P3,12	P3,21	P3,12	P3,21		_
3m         F 3m         F 3th         F 3	~ <b>=</b> .		. R32	į		,	1	1	1/12	
".         6         P6         P6, P6, P6         P6,		34	P31a	PJIo	P301	75 75 75 75 75 75 75 75 75 75 75 75 75 7	K3m R3m	R3c R3c		
67 P6 P6 P63/m  622 P622 P6422 P6422 P6422 P6522  6mm P6mm P6cc P63cm P63mc  6md P6mm P6cc P63cm P63mc  6md P6mm P6cc P63cm P63cc  6mm P6mm P6mc P63cm P63cc  6mm P6mm P6mc P63cm P63cc  123 P73 P73 P73 P73 P73 P73  432 P432 P432 P432 P432 P432  431 P432 P432 P432 P432 P432  432 P432 P432 P433 P432 P433  431 P432 P432 P432 P433 P433  432 P432 P432 P433 P433 P433  433 P432 P432 P433 P433 P433  434 P436 P436 P436 P436  675 P6476 P6476 P6476  676 P6476 P6476 P6476  677 P6477 P6477 P6477 P6477  677 P6477 P6477 P6477  678 P6477 P6477 P6477  678 P64	2	9	*	. P6.	P6,	P6.	76.	P6.		
6/m         P6/m         P6,12         P6,13         P6		20	28	·	•	•		,	1/12	
622 P622 P6,22 P6,22 P6,22 P6,22 P6,32 P7,3 P7,3 P7,3 P7,3 P7,3 P7,3 P7,3 P7,3	•	6fm	P6/m	P63/m		•			ſ,	
6mm         Pómm         Póce         Pósm         Pósme           6m2         Pón         Pós         Pósm         Pós           6m²         Pón         Pós         Pósm         Pós           23         P23         P23         P23         P21,3         12,3           m3         Pm3         Pm3         Fm3         Fm3         Pa3           432         P4,32         P4,32         F4,32         P4,32         P4,32           73m         P4,3m         F3m         Pm3m         Pm3m         Pm3m         Fm3m           83m         Pm3m         Pm3m         Pm3m         Fm3m         Fm3m         Fm3m	Hexagonal	622	P622	P6,22	P6,22	P6,22	P6,22	P6,22		
6m2         P6n2         P62n         P62n         P62c           6/mmm         P6/mmm         P6/mcc         P6,mcn         P6,mcn         P6,mcn           23         P23         F23         F23         F2,3         F2,3         F2,3           432         P432         P4,32         F4,32         F4,32         F4,32         P4,32           43m         P43m         F3m         F3m         F3m         F43m         F43c         F43c           73m         P6,32         P7,3         P7,3         P7,3         P7,3         F43c         F43c         F43c           73m         P6,3         P7,3		• 6тт	P6mm	Péce	Pésem	P6smc	•		707	
6/mmm         P6/mmm         F6/mc         P6s/mcm         P6s/mmc           23         P23         P23         P23         123         P213         P213 <t< td=""><td></td><td>5m2</td><td>PSm2</td><td>P&amp;c2</td><td>P82m</td><td>P820</td><td></td><td></td><td><u> </u></td><td></td></t<>		5m2	PSm2	P&c2	P82m	P820			<u> </u>	
23         P23         F23         F23         P213         I23         P213         I213           m3         Pm3         Pm3         Fm3		6/ուորո	P6/mmm	P6/mcc	P6s/mcm	P63/mmc				
m3         Pm3         Pn3         Fm3         Fd3         Im3         Pa3           432         P432         P432         P432         P432         P432         P432           432         P432         P432         P432         P432         P432           43m         P43m         F43m         F43c         I43d           m3m         Pm3m         Pm3m         Fm3m         Fm3m           Fd3m         Fd3m         In3m         Fm3m         Fm3m		23	P23	F23	123	P2 <sub>1</sub> 3	72,3			
432 P432 F432 F432 P4 <sub>1</sub> 32 P4 <sub>5</sub> 32 P <sub>5</sub> 3m P		m3	Pm3	Pn3	Fm3	Fet3	fm3	Pa3	1/24	.5
432     P432     P4,32     F432     P4,32     P4,32       P4,32     14,32     P4,32     P4,32     P4,32       P4,32     14,32     P4,32     P4,32       P3m     P43m     P43m     P43m     P43c       m3m     Pm3m     Pm3m     Pm3m     Fm3c       F43m     F63m     F63m     Fm3m     Fm3m			Ia3						-	pac
P4,32	Oubic	432	P432	P4,32	F432	F4,32	1432	P4,32		e G.
P43m F43m I43m P43n F43c I43d Pm3m Pn3n Pm3m Fm3c F43m F43c Im3m In3m In3m			P4,32	14,32		• 0				rou
Pm3m Pn3n Pm3m Pm3m Fm3m Fm3m Fd3m Fd3c Im3m Ia3d		43m	P43m	F43m	I43m	P43n	F43c	1434	1/48	ps
Fd3c Im3m la3d		m3m	Pm3m	Pn3n	Pm3n	Pn3m	Fra3m	Fm3c		
			FdJm	Fd3c	Im3m	la3d				5

\* The eleven Laue symmetries are separated by horizontal lines.

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